CALIFORNIA ENERGY EFFICIENCY STANDARDS

PURPOSE AND SCOPE

The purpose of the California Energy Efficiency Standards is to regulate the source energy consumption of buildings. Source energy includes all energy consumed in the production and delivery of the energy used in a building. For example, a typical method of producing electricity involves locating an underground oil field, drilling a well to access it, pumping it into shipping containers, transporting it to the generating plant, converting it to electricity, and distributing it to the end user, as well as the considerable paperwork involved throughout the entire process. Each of these processes consumes energy. The total source energy for the electricity used at the building includes the energy consumed by all of these steps in addition to the energy in the oil itself.

The underlying reason for energy efficiency being mandated by law has its roots in the oil shortages of the 1970's. Our dependence on foreign oil became a national security issue. If we used less energy, the lawmakers reasoned, we would be more independent. More recent events, deregulation, spiraling energy costs, rolling blackouts etc., have reemphasized the need for energy conservation.

MANDATORY REQUIREMENTS

All residences must meet certain mandatory energy efficiency requirements, regardless of the compliance method used. These are listed on the MF-1R form, the Mandatory Measures Checklist, which must be submitted for all new conditioned residential space.

PILOT LIGHTS

Continuously burning pilot lights are prohibited in central furnaces, cooking appliances, pool heaters and spa heaters. Strangely enough, this applies only to natural gas and not to propane.

JOINTS AND OPENINGS

"Joints and other openings in the building envelo pe that are potential sources of air leakage shall be caulked, gasketed, weatherstripped, or otherwise sealed to limit infiltration and exfiltration."

MINIMUM INSULATION

Minimum insulation levels in frame walls are R-19 ceilings, R-13 walls, and R-13 floors. In order to show compliance for the overall building, one or more of these will most likely need to be higher, but they can never be lower in new construction, even if the calculations show that the overall building complies that way.

FIREPLACES

Masonry and factory-built solid-fuel fireplaces must have:

- Closable metal or glass doors covering the entire opening of the firebox
- A closable combustion air duct from outside the building into the firebox, at least 6 square inches in area
- a flue damper with a readily accessible control

If the fireplace is on a slab floor and not located on an exterior wall, the combustion air duct is not required.

SETBACK THERMOSTAT

Central heating and cooling systems are required to have a programmable thermostat with at least two separate periods within 24 hours.

WATER HEATER INSULATION

Water heater efficiency is rated with an energy factor (EF). Gas water heaters with an EF rating less than .58 are required to have an R-12 external insulation blanket. The EF is not always marked on the water heater, nor is it always given in the literature that comes with the heater. If this is the case, manufacturer's documentation of the EF must be requested from the supplier or manufacturer of the heater.

The first 5' of hot and cold water piping from the water heater must be insulated with R-4 pipe insulation. This insulation requirement also applies to all piping in hot water recirculating systems.

LIGHTING

Kitchens must have general lighting with an efficiency of at least 40 lumens per watt. "General lighting" will provide a uniform pattern of light which is sufficient for basic kitchen tasks. Only fluorescent, metal halide, and high-pressure sodium lighting meet this standard, and the latter two are not normally used for indoor residential lighting. This general lighting must be controlled by a switch located at an entrance to the kitchen.

Each room with a shower or bathtub must also have lighting which meets this standard. If the room has more than one lighting source, the high-efficiency light must be controlled by a switch located at an entrance to the room. This requirement need not be met if both of the following are provided:

- Fluorescent lighting in a garage, laundry room, or utility room, and
- All outdoor lights must be at least 40 lumens per watt or controlled by a motion detector

Lights which are installed to meet these requirements are not allowed to have incandescent lamp sockets, nor can any incandescent lights be controlled by the same switch as the high-efficiency lighting.

All incandescent light fixtures which are recessed into insulated ceilings must be approved and marked "IC" for insulation contact.

COMPLIANCE METHODS

The 1999 Energy Efficiency Standards recognize only two methods of showing residential compliance; packages (prescriptive method) and computer analysis (performance method). The hand calculated point system which was allowed in previous editions of the Standards is no longer recognized.

Both compliance methods require the submission of the CF-1R and MF-1R forms. The CF-1R, Residential Certificate of Compliance, provides a general description of the building and how it will comply with the Standards. The MF-1R, Mandatory Measures Checklist, lists all mandatory requirements and shows which ones apply to the building.

The documents submitted to show compliance become part of your approved plans. These documents show the required levels of insulation, the maximum U-value and SHGC (solar heat gain coefficient) of the windows, and minimum efficiency of the furnace, air conditioner, and water heater. In order to avoid unpleasant surprises during inspections, you should be aware of the requirements in this documentation.

PACKAGE COMPLIANCE - PRESCRIPTIVE METHOD

Package compliance is the simplest to document, but allows the least amount of choice in how the building will comply with the Standards. It consists of a list of building features which must be provided. There are actually four such lists to choose from, but the first three are special-purpose construction methods which are seldom used in our area. These lists prescribe minimum insulation levels, maximum U-value and SHGC ratings for glazing, maximum amount of glazing (based on a percentage of the floor area), thermal mass in some cases, and appliance efficiency.

The fourth list (Package D) requires the following:

- R-38 ceilings
- R-19 walls
- R-19 raised floors
- Maximum .65 glazing U-values
- Maximum glazing area of 16% of the conditioned floor area
- Maximum .40 Solar Heat Gain Coefficient for west and east-facing windows
- Minimum .78 AFUE furnace
- Minimum 10.0 SEER air conditioning (if installed)
- A gas water heater of 50 gallons or less

Most of these requirements can be met using typical local construction methods, except for the wall insulation, which is usually R-13, and Low-E (maximum .40 SHGC) windows on the east and west sides.

No documentation is normally required other than the two basic forms listed above. The CF-1R simply indicates that Package D (or A thru C) is the compliance method and lists all the relevant building features to show that all the requirements in the Package list will be met. These forms are available at the Community Development Department counter.

APPROVED COMPUTER PROGRAMS - PERFORMANCE METHOD

This compliance method allows the most flexibility in the design of the building, but is normally done by a professional energy consultant, due to the cost and complexity of the software. These programs are based on the "Standard" Package D described above, but other than meeting the mandatory minimums, unlimited trade-offs can occur. For example, if you wish to have more than the prescribed amount of window area, you can make it up by using better-than-required U-values, a more efficient furnace, etc. The software calculates all these trade-offs and determines whether or not your design will be as efficient as Package D. In most cases, all of the required forms are printed by the program.

ADDITIONS AND ALTERATIONS

ADDITIONS

An addition is an increase in both floor area and volume of conditioned space.

Prescriptive compliance for additions is generally the same as for new buildings. Each requirement listed for the selected package must be met. However, the following modifications of Package D are permitted for additions of less than 1000 square feet:

- Additions of less than 100 square feet require minimum insulation of R-19 ceiling, R-13 walls, and R-13 wood floors. Windows must be no more than .75 U-value with no SHGC requirement and must not exceed 50 square feet of area. Heating and cooling appliances need only meet mandatory requirements and water heating need not be considered.
- Additions of less than 500 square feet may have R-13 wall insulation. Windows must be no more than .75 U-value and their area is limited to 16% of the floor area plus any glazing removed to allow for the construction of the addition. Water heating need not be considered.
- Additions of 500 to 999 square feet may have R-13 wall insulation and the window area is limited to 16% of the floor area plus any glazing removed to allow for the construction of the addition.

Performance compliance for additions is shown with an approved computer program. There are three ways to show compliance for additions using the performance analysis method. The first and most common is to analyze the addition alone in the same way a new building would be done. If the addition doesn't comply that way, the existing-plus-addition method can be used. This method credits improvements in the existing building toward the addition. It will always help the calculations somewhat due to the elimination of a portion of the existing exterior wall where the addition attaches to the existing building. This makes the existing portion of the building more energy-efficient. If improvements such as window replacements are being done in the existing building, it will help the calculations quite a bit. The third and least used method is the whole building method, which would only be useful if the existing building is very energy efficient and the addition is not. In this method, the existing and new portions of the building are considered together as if it were an entirely new building.

ALTERATIONS

An alteration is a change in the building which is not an addition. The construction of a loft in a room with a high ceiling would be an increase in floor area but not in volume, so it would be an alteration. If a ceiling is raised, it increases the volume but not the floor area, so that would also be an alteration. Like new buildings and additions, alterations can be shown to comply with either a prescriptive or performance analysis method.

Prescriptive compliance for alterations requires all of the following:

- All applicable mandatory requirements must be met
- Newly installed and relocated windows must be maximum .75 U-value
- gas appliances can't be replaced with electric ones

Performance compliance for alterations can be shown with an approved computer program. It would be used where the prescriptive requirements are not acceptable. Unlike new buildings and additions, alterations don't have a newly conditioned square footage. But the programs still ask for such a figure. The code says this figure should be "The permitted space alone, which shall be a minimum of the square footage of the room in which the alteration is made.." In other words, it should be the area involved in the work, with a minimum of one room. There is also an existing-plus-alteration method, similar to the existing-plus-addition method, where improvements made to other portions of the building can be credited to the alteration.

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